

# Navy Personnel Research and Development Center

San Diego, California 92152-6800

TN-92-6

December 1991



NPRDC / TN-92-6

## Relationship of Mental and Educational Levels of Navy Male Enlisted Personnel to Job Outcome Criteria

Charles H. Cory  
Paul P. Foley  
Stephanie Booth-Kewley

REFERENCE 2.3

20001117 056

NPRDC LIBRARY

APR 13 1992

SAN DIEGO, CA

Reproduced From  
Best Available Copy

Approved for public release; distribution is unlimited.

AQ401-01-0009

**Relationship of Mental and Educational Levels of  
Navy Male Enlisted Personnel to Job Outcome Criteria**

Charles H. Cory  
Paul P. Foley  
Stephanie Booth-Kewley

Reviewed, approved and released by  
W. A. Sands  
Director, Personnel Systems Department

Approved for public release;  
distribution is unlimited.

Navy Personnel Research and Development Center  
San Diego, California 92152-6800

## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 1991		3. REPORT TYPE AND DATE COVERED Final--Jan 86-Feb 87	
4. TITLE AND SUBTITLE Relationship of Mental and Educational Levels of Navy Male Enlisted Personnel to Job Outcome Criteria				5. FUNDING NUMBERS Program Element 0909000N, Work Unit WRB1008	
6. AUTHOR(S) Charles H. Cory, Paul P. Foley, Stephanie Booth-Kewley					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Navy Personnel Research and Development Center San Diego, California 92152-6800				8. PERFORMING ORGANIZATION REPORT NUMBER NPRDC-TN-92-6	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Chief of Naval Operations (OP-13F) Washington, DC 20350-2000				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) <p>The objectives of the research were to (1) validate enlistment standards against job outcome criteria, (2) compare the average job outcomes of personnel who were below enlistment standards with those of personnel who met standards, and (3) develop background information about job outcome measures.</p> <p>A sample of 71,000 males enlisted during 1976 was extracted from Navy records. They were classified according to membership in five mental level (ML) categories and three educational level categories. A subset of the sample who enlisted erroneously, due to Armed Services Vocational Aptitude Battery misnorming, were identified and their enlisted performance compared to that of fully qualified enlistees. They were compared on six job outcome and three advancement examination criteria extracted from Navy records.</p> <p>Study conclusions were:</p> <p>Level of education acquired prior to accession is strongly associated with success. High school graduates have substantially better advancement, attrition and disciplinary records than either nonhigh school graduates (NHSGs) or individuals with general education development (GED) certificates. GEDs have somewhat better performance than NHSG certificates, but the differences were not that great.</p> <p>Personnel in high ML categories had better advancement and attrition records than low ML personnel, however, this may be a function of high ML personnel being assigned to ratings with faster advancement potential. In summary, enlistment standards screen out the least capable as indicated by marked decreases in promotion and retention of individuals unqualified.</p>					
14. SUBJECT TERMS ASVAB, validation, performance, measurement, selection				15. NUMBER OF PAGES 56	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED	19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	20. LIMITATION OF ABSTRACT UNLIMITED		

## FOREWORD

This research was conducted in support of the Navy's program for validation of the Armed Services Vocational Aptitude Battery (ASVAB). The goal was to investigate the utility of job performance measures other than training school achievement which traditionally has been used as the criterion measure for ASVAB validation. Job outcome criteria such as advancement, attrition/retention, and disciplinary infractions were considered as practical measures against which to validate the effects of personnel selection standards. The misnorming of the ASVAB resulted in the enlistment of several thousand personnel who were below Navy requirements at the time. This data set in combination with a fully qualified cohort was used to evaluate the suitability of the Navy enlistment standards. Enlistment standards were found to screen out the least capable personnel in terms of promotion and retention outcomes. It was concluded this approach could serve as a useful supplement to, but not a replacement for, hands-on performance tests.

This effort was sponsored by the Chief of Naval Operations (OP-13) and Bureau of Naval Personnel (PERS-234), funded by program element 0909000N, work unit WRB1008. Results are intended for use in policy decisions regarding enlistment standards of Navy military personnel as well as by the research community. This investigation represents a small part of an on-going effort to make the optimal use of human resources in the Navy.

W. A. SANDS  
Director, Personnel Systems Department

## SUMMARY

### Problem

Navy enlisted personnel selection tests have almost always been validated against training school achievement. In 1980, however, questions were raised concerning the relationship of the selection standards to performance on the job. Both the Department of Defense and the United States Congress directed that the standards be validated against job performance as well as training achievement. Consequently, Job Performance Measurement, a major Joint Service effort to develop hands-on tests for measuring job performance, was initiated. Job outcome criteria such as advancement, attrition/retention, and disciplinary infractions are practical measures which are useful supplements to hands-on performance tests for measuring job performance. Together, hands-on performance and job outcome measures can provide a balanced description of the effects of personnel selection standards on the quality of Navy enlisted personnel.

### Objective

The objectives of the research were to (1) validate enlistment standards against job outcome criteria, (2) compare the average job outcomes of personnel who were below enlistment standards with those of personnel who met standards, and (3) develop background information about job outcome measures.

### Approach

Misnorming of the scores of the Armed Services Vocational Aptitude Battery (ASVAB) forms 5, 6, and 7 resulted in Navy enlistment during 1976 of several thousand personnel who were below the Navy requirements at that time. The records of these personnel were used to evaluate the suitability of the current mental level (ML) and education (ED) standards for Navy enlistment.

The complete male cohort that enlisted in 1976 was extracted from Navy records. These data were classified according to five ML categories, based on the Armed Forces Qualification Test, and three ED categories, corresponding to Navy standards. Those personnel who had ASVAB scores below enlistment standards were grouped into two categories according to the proximity of their scores to the actual standard.

Six job outcome and three advancement examination criteria were extracted from Navy records. The criteria were selected to describe important practical aspects of enlisted job performance, although they were not independent and there was some overlapping coverage. The relationships of ED and ML to the criteria were investigated by correlation coefficients, principal component analyses, and by plotting and inspecting the criterion means of ED and ML subgroups. Estimates of the effects of lowering enlistment standards were made by comparing the criterion distribution of the lowest ML that met enlistment standards with that of personnel who were below the enlistment standards.

The sample used for this research contained about 71,000 males and thus was sufficiently large so that the calculations would be highly reliable and representative, not only for the ED and ML categories, but also for paygrade subcategories.

4. Advancement, attrition, and disciplinary records provide useful job outcome criteria. However, the pass/fail dichotomy of the E-4 advancement examination is not a useful criterion because it does not differentiate well among the examinees (98 per cent of whom pass the examination).

# CONTENTS

	Page
INTRODUCTION .....	1
Background.....	1
Use of AFQT Scores for Personnel Selection.....	1
ASVAB Misnorming .....	2
Potentially Ineligibles.....	2
Usually Ineligibles .....	2
Problem.....	3
Objectives .....	3
APPROACH .....	3
Sample .....	3
Predictors .....	4
Criteria .....	4
Procedure .....	5
Analyses .....	6
RESULTS AND DISCUSSION .....	7
ED-ML Subsample Sizes .....	7
Correlations of ED and ML Categories with Personnel-Record-	
Based Criteria .....	7
Comparison of Criterion Means for ED Groups and ED-ML Subgroups.....	10
Advancement Criteria .....	10
Attrition/Retention Criteria .....	10
Maladaptive Behavior .....	21
Advancement Examination Outcomes.....	21
Criterion Comparisons for Personnel in Entry-level	
Paygrades E-2 and E-3.....	21
Percentage Differences in the Criterion Distributions of PIs and the	
Lowest (Acceptable) MLs .....	21
Factor Structure of Six Job Performance Criteria .....	22
Summary of Major Findings .....	22
CONCLUSIONS .....	24
REFERENCES .....	25
APPENDIX A--RELATIONSHIP OF MENTAL LEVEL (ML) AND	
EDUCATION (ED) TO JOB OUTCOME VARIABLES FOR	
PERSONNEL ACCESSIONED AS E-2 OR E-3 .....	A-0

## INTRODUCTION

### Background

Since the end of World War II, mental eligibility for Navy enlistment has been determined primarily by a person's score on the Armed Forces Qualification Test (AFQT). In addition, since the late 1960s an education requirement has been part of the standard, with higher AFQT scores required for nonhigh school graduates (NHSGs) than for high school graduates (HSGs).

Prior to 1 January 1976, classification and assignment decisions for Navy personnel were based on scores from two batteries of mental ability tests (the Basic Test Battery and the Special Qualification Tests). On 1 January 1976, these tests were replaced by the Armed Services Vocational Aptitude Battery (ASVAB), forms 5, 6, and 7. This battery of 12 mental ability tests was used both for selection into the Navy and for classification into "A" school or general detail billets. ASVAB tests replaced the AFQT, the Basic Test Battery, and the Special Qualification Tests. Scores from the Word Knowledge, Arithmetic Reasoning, and Spatial Perception subtests of ASVAB 5, 6, and 7 were combined to compute an AFQT score. As was true for all preceding AFQT tests, the new AFQT scores were calibrated back to the World War II mobilization population.

### Use of AFQT Scores for Personnel Selection

Table 1 presents the AFQT score ranges and mental level (ML) classifications as originally determined and as subsequently renormed. Table 1 shows that there were substantial differences in the original and renormed ("correct") AFQT score ranges for some MLs. For example, ML 4 personnel received original AFQT scores ranging from 11 to 45 versus their renormed score range of 10 to 30. Similar, but somewhat smaller discrepancies occurred for the AFQT score ranges for the Low 3, High 3, 2, and 1 MLs.

**Table 1**

**Mental Level Definitions Based on Correct  
and Original Armed Forces Qualification Test (AFQT) Scores**

Mental Level	Range of AFQT Scores	
	Correct	Original
1	93-99	94-99
2	65-92	65-93
High 3	49-64	54-64
Low 3	31-48	46-53
4	10-30	11-45
5	1-9	1-10

MLs provide shorthand designations for enlistment eligibility and trainability categories. When personnel involved in this study enlisted, those personnel in Low 3 and 4 MLs were called nonschool eligible because their test scores were generally too low to qualify them for "A" school training. Conversely, personnel in MLs 1 through High 3 were designated as school eligible. Personnel in ML 5 were not eligible for enlistment.



## Problem

Selection tests for Navy enlisted personnel have usually been validated against training criteria (Swanson, 1979; Thomas, 1969, 1972a, 1972b). However, there is concern that selectors be validated against job performance in addition to achievement in training courses. As a result, the military services have research programs to validate their selection standards against measures of job performance. Initial studies have detailed the relationship of the ED and ML standards used for enlisted personnel selection with measures of job performance drawn from the enlisted history records (Greenberg, 1980; Hiatt & Sims, 1980). Both studies found that ED and ML were substantially related to school and job performance as measured by criteria that were drawn from personnel records. These criteria included performance in military training schools, attrition prior to completion of enlistment, and rate of advancement. The goals of these studies were (1) to investigate the utility of personnel records as criteria for validation of selection standards and (2) to evaluate the effectiveness of selection standards.

## Objectives

The purposes of the current study were to (1) validate enlistment standards (AFQT and ED) against important Navy job outcome criteria, (2) compare the job performance of unqualified personnel, who were accessioned as a result of the ASVAB misnorming and special recruiting programs, with that of personnel who met the enlistment standards; and (3) develop background information concerning job outcome measures.

## APPROACH

### Sample

Data for the study were drawn from three different sources:

1. The Navy Enlisted Cohort History (NECH) tape of June 1981. The tape, developed and maintained by the Naval Health Research Center, contains information on the enlistment histories of all personnel who began active duty subsequent to 1 January 1965.
2. Tapes for the E-4 advancement examinations of April and October 1978 and 1979 (CANDAB). These tapes were prepared by Navy Personnel Research and Development Center (NPRDC) and contain summary records for the E-4 advancement examinations.
3. The Enlisted Master Tape (EMT) extracts of June 1977 and January 1978. The EMT contains comprehensive information on the mental, biographical, and Navy school and job characteristics of all enlisted personnel who were present in the Navy on the creation date of the tape.

The complete cohort of a calendar year 1976 (CY76) ( $N = 87,527$ ) was extracted from NECH. For this cohort, ASVAB scores and "A" school graduation records were extracted from the EMT tapes, and advancement examination data were extracted from the CANDAB tapes. The records from these three sources were combined into a single database. Subjects were then deleted from the sample if (1) they lacked ASVAB scores, (2) they were reservists, (3) their status as regular or reservist was unknown, (4) they were female, (5) they were 6-year obligors, (6) their ED was unknown, or (7) their ML was unknown. After all deletions had been made, the sample contained 71,052 personnel. Table 3 shows the numeric compositions of the original cohort and those formed from the successive eliminations.

**Table 4**  
**Description of Criterion Variables**

Name	Acronym	Description
<b>Advancement</b>		
Percentage time at E-4	PTE4+	Percentage of a 4-year first enlistment period spent at or above E-4.
Percentage E-4s	E4%	A binary variable coded "1" if the individual attained E-4 and "0" otherwise.
<b>Attrition/Retention</b>		
Completed enlistment	COMPEN	A binary variable coded "1" if the individual completed acceptably 42 months of service or extended past 4 years and "0" otherwise. (Personnel who were deserters at the time of the data extraction were coded "0.")
Less than a year of service	LESSYR	A binary variable coded "1" if the individual attrited before completing 1 year of service and "0" otherwise.
<b>Maladaptive Behavior</b>		
Overall behavioral problems <sup>a</sup>	OVBVPROB	A composite criterion formed by taking two times the number of demotions plus two times the number of desertions plus the number of unauthorized absences.
Total demotions	TDEMO	Total number of demotions received during the 4-year enlistment period.
<b>Advancement Examination Outcomes</b>		
Pass E-4	PAS4	A binary variable coded "1" if the individual took and passed the E-4 advancement examination and "0" if the individual took it and failed.
Advance E-4	AD4	A binary variable coded "1" if the individual took and was promoted to E-4 from the advancement examination and "0" if he took it and was not promoted.
Score E-4	SCOR4	Navy Standard Score on the E-4 advancement examination.

<sup>a</sup>See footnote 1.

The criteria are not independent. Overlap in coverage occurs within each of the categories. For instance, percentage of time at E-4 or higher is measured on a subgroup of the achieved/not achieved E-4 group. The criteria were selected to describe important practical aspects of enlisted job performance even at the expense of overlapping coverage.

### Procedure

Pearson product-moment correlations were computed between the predictor variables (ML and ED) and each of the nine criteria. This was done for the total group and for each of the three entry-level paygrade groups: E-1, E-2, and E-3. Enlistment at higher entry-level paygrades (E-2 and E-3) is a function of special enlistment programs that credit time spent in advanced training, either in college or vocational school, or experience in the Naval Sea Cadet Corps, Junior Reserve Officer Training Corps, or an appropriate occupation.

## RESULTS AND DISCUSSION

### ED-ML Subsample Sizes

Table 5 presents numerical and percentage breakdowns of the sample by ED and ML categories. HSGs constituted the largest ED group (74%), while NHSGs and GEDs constituted the second (19%) and third (7%) largest groups, respectively.

ML 2 constituted the largest ML group (41%), while ML High 3 and ML Low 3 constituted the second (15%) and third (10%) largest groups respectively. Over 18 percent of the CY76 sample (11% PIs and 7% UIs) did not meet the selection standards.

### Correlations of ED and ML Categories with Personnel-Record-Based Criteria

Validity coefficients of ED and ML for the nine personnel-record-based criteria are shown in Table 6. For ED, 7 of 9 overall and 18 of the 21 entry paygrade validity coefficients were statistically significant, although a number of them were very low. For ML, 7 of 9 overall and 19 of the 21 entry paygrade validity coefficients were statistically significant. The large percentages of statistically significant coefficients occurred in part because the large sample size.

In general, validity coefficients for ED have signs which are opposite those for ML. This occurs because the direction of the ED scale is positive (larger numbers indicate greater amounts of education); whereas, the direction of scaling for ML is negative (larger numbers indicate lower mental ability). For this reason, the important comparison between the two coefficients is one of magnitude: The sign or direction of the validity coefficient is an artifact of the scaling of the predictors.

ED was most highly correlated with advancement criteria, but it was not related to advancement examination criteria. It was lower but still related to attrition/retention and maladaptive behavior criteria. ML was most correlated with advancement outcomes and for the E-4 advancement examination score. The relationship of ML to attrition/retention and maladaptive behavior criteria and for PAS4 and AD4 ranged from small to nonexistent.

The third columns in the four grouping sections of Table 6 show the criterion correlations achievable by using as predictors composites of ED and ML formed by multiple regression weights. The principal improvements for using the two-predictor composite occurred for advancement criteria. Use of both ED and ML as predictors for attrition/retention, maladaptive behavior, and advancement examination criteria would not result in any appreciable increase in validity coefficients over those of the single best predictor.

The coefficients for the overall groups were generally higher than those for their respective entry paygrade subgroups. This is probably attributable to the fact that the standard deviations of the overall groups are larger than those of the entry paygrade subgroups.<sup>2</sup>

---

<sup>2</sup>The frequency distributions of the variables in Table 6 influence the interpretation of their correlation coefficients because the maximum correlation coefficient which can be calculated between two variables is limited by the degree of similarity in the shapes of their frequency distributions. Therefore, caution should be used in interpreting these coefficients.

Table 6  
Validity Coefficients for ED and ML for Nine Criteria

Criterion	Overall Group			Entry Paygrade Subgroup									
	ED	ML	Max R <sup>a</sup>	E-1			E-2			E-3			
				ED	ML	Max R	ED	ML	Max R	ED	ML	Max R	
<u>Advancement</u>													
PTE4+	.24***	-.27***	.38	.21***	-.10***	.25	.17***	-.10***	.21	.11***	-.23***	.26	
E4%	.24***	-.13***	.28	.22***	-.05***	.24	.15***	-.04***	.17	.12***	-.17***	.20	
<u>Attrition/Retention</u>													
COMPEN	.19***	-.04***	.21	.20***	-.01*	.21	.13***	-.02***	.13	.06***	-.03***	.07	
LESSYR	-.14***	.06***	.16	-.14***	.03***	.13	-.08***	.04***	.09	.07***	.06***	.09	
<u>Behavioral</u>													
OVBVPROB	-.18***	.02	.18	-.18***	-.01**	.18	.17***	.01	.18	-.08***	-.03***	.08	
TDEMO	-.09***	.00	.09	-.09***	-.01**	.09	-.09***	-.02***	.09	-.03***	-.01	.03	
<u>Advancement Examination</u>													
SCOR4	-.07***	-.35***	.35	-.02	-.34***	.34	.02	-.39***	.39	-.02	-.43***	.43	
PAS4	.00	.06***	.06	—	—	—	—	—	—	—	—	—	
AD4	.00	.06***	.06	—	—	—	—	—	—	—	—	—	

Note. PIs and UIs are omitted from these calculations.

<sup>a</sup>Correlation for the optimally weighted composite of ED and ML.

\*p < .05.

\*\*p < .01.

\*\*\*p < .001.

# PAYGRADE 1

HSG ▲  
GED ■  
NHSG ●

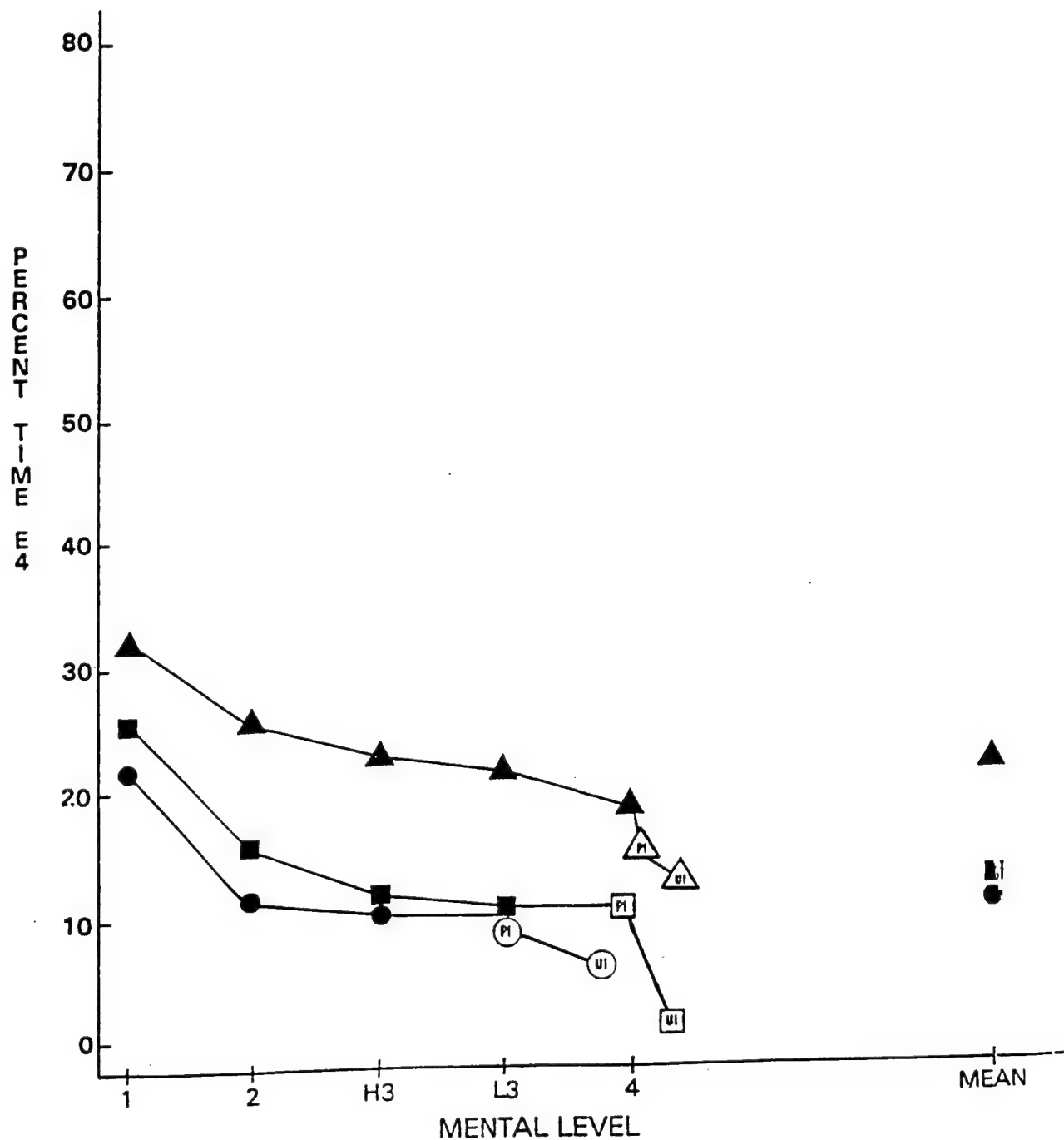


Figure 1. Paygrade 1: Percent of 4-year enlistment period spent as an E-4 or higher.

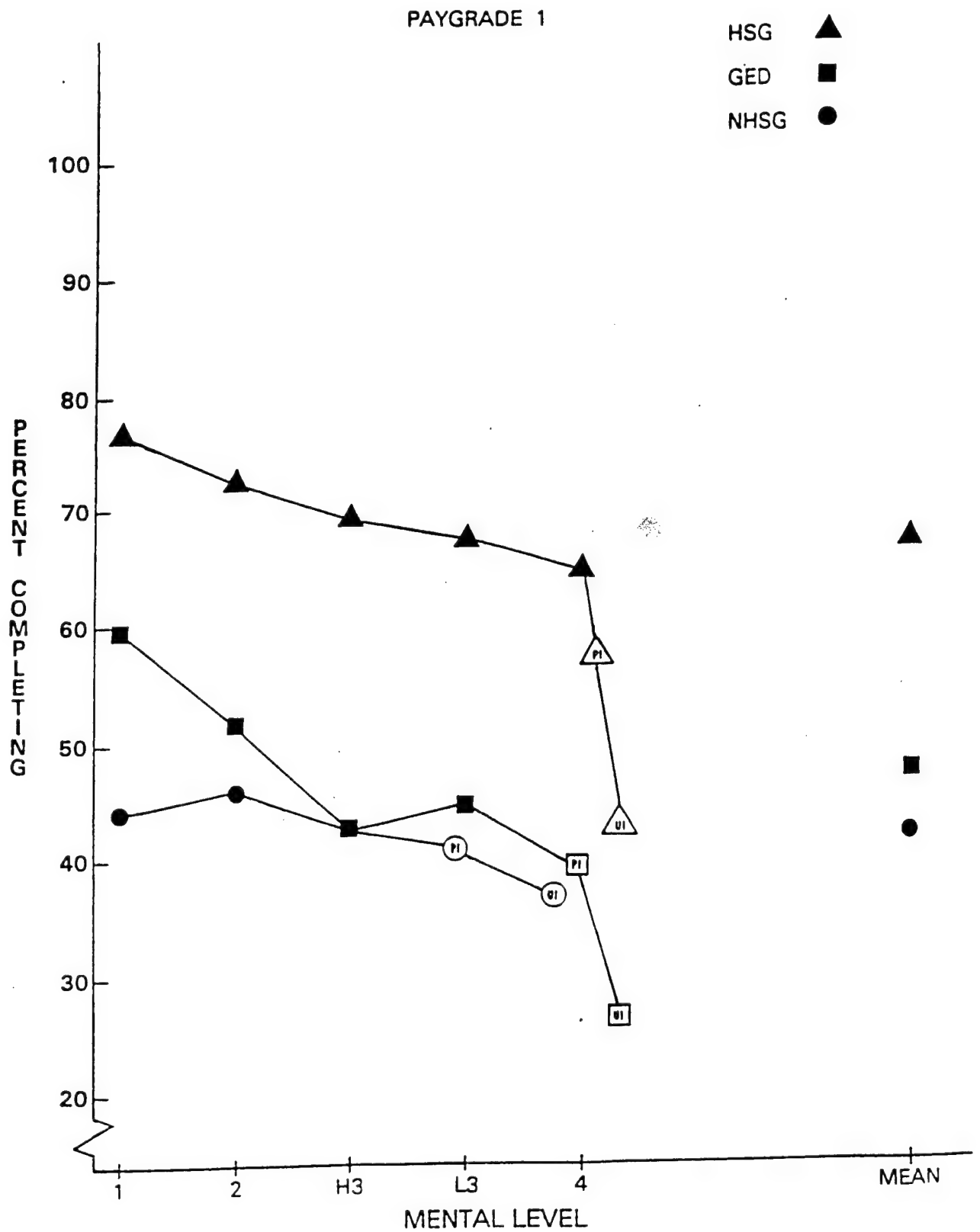


Figure 3. Paygrade 1: Percentage completing 4-year enlistment.

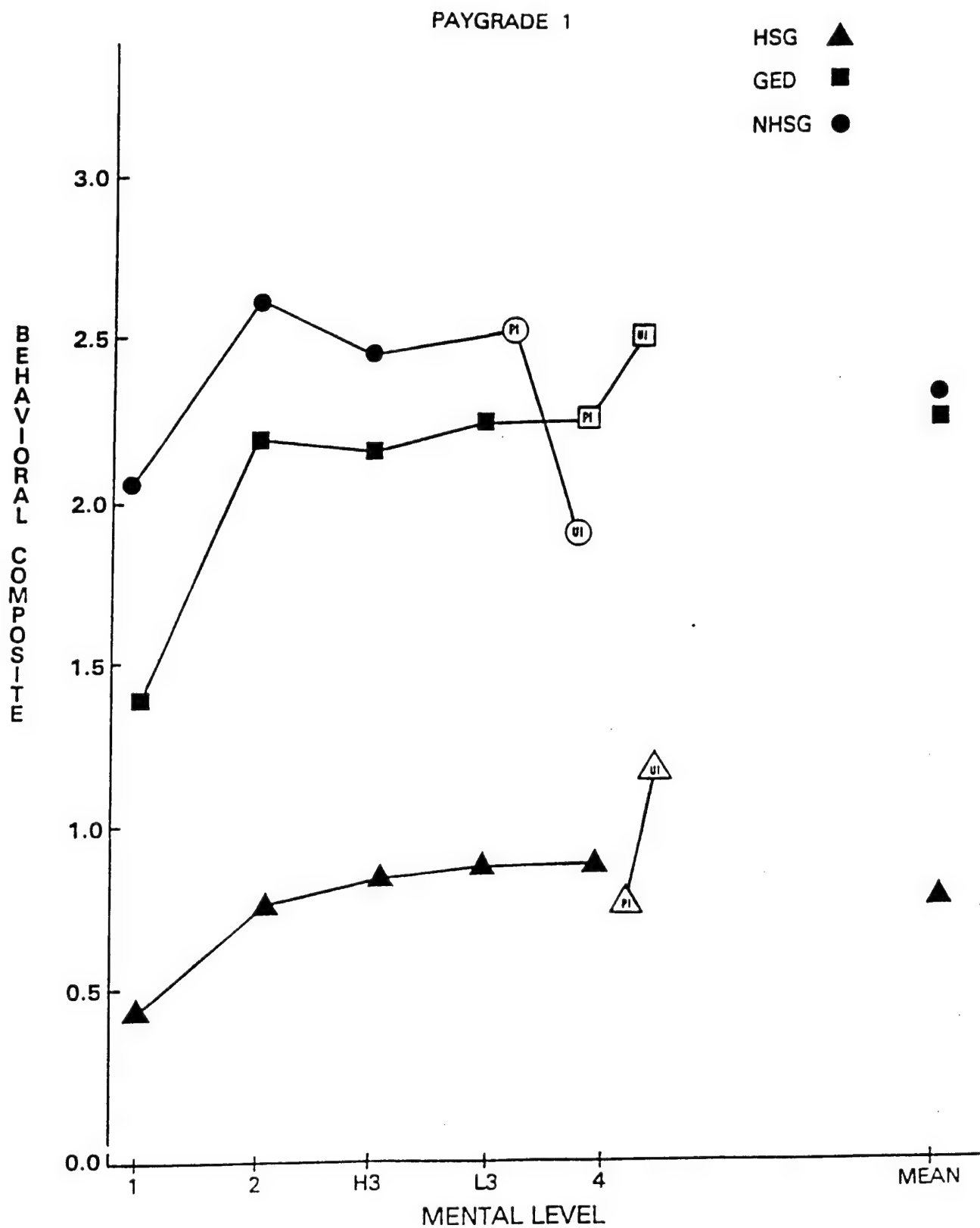


Figure 5. Paygrade 1: Overall behavioral problems.

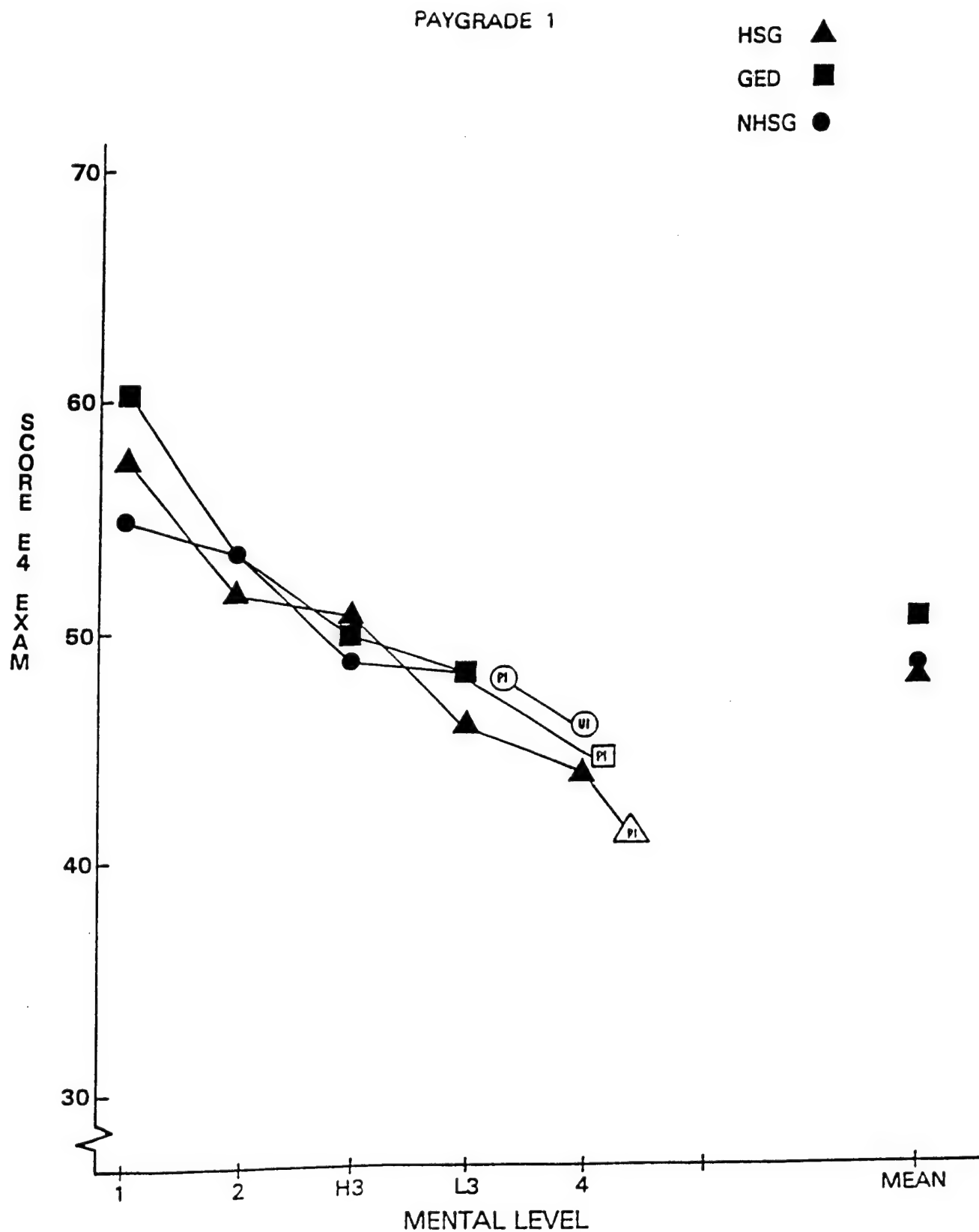


Figure 7. Paygrade 1: Navy standard scores for E-4 exam.



# PAYGRADE 1

HSG ▲  
GED ■  
NHSG ●

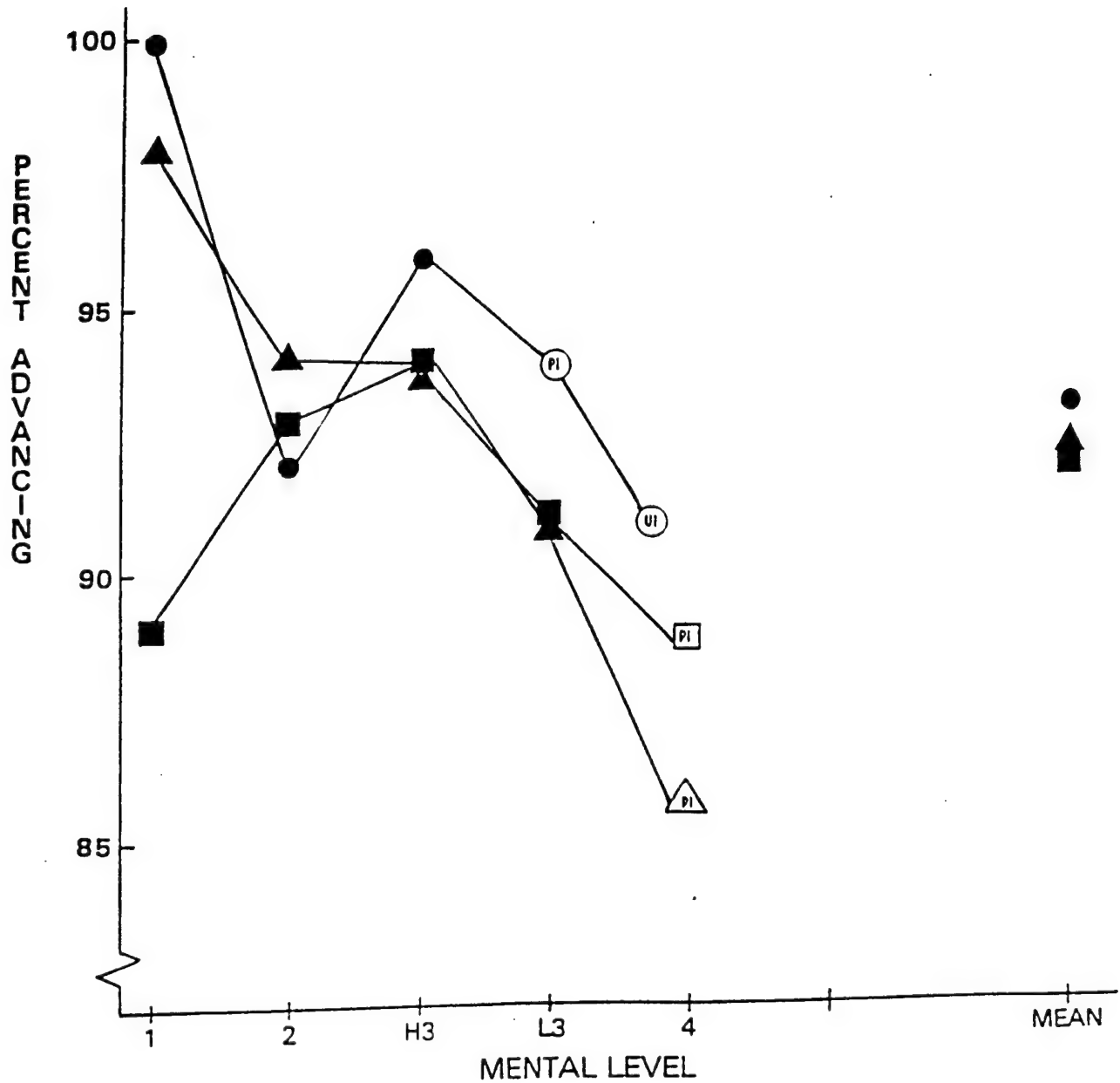


Figure 9. Paygrade 1: Percentage of those taking the promotional exam for E-4 that advanced to E-4.

Figure 4 shows that first-year attrition was more likely in lower ML groups. For HSGs, first-year attrition increased monotonically with decreases in mental ability.

PIs and UIs had greater percentages attriting and smaller percentages completing their enlistments than ML 4s, the lowest mental ability category of HSGs that meets Navy enlistment standards. The data on percentage completing enlistment, in conjunction with that for first-year attrition, indicate that about half of the attrition occurred during the first year of service.

### **Maladaptive Behavior**

Figure 5 shows that HSGs had better behavior records than NHSGs and GEDs and that, for HSGs, lower MLs were associated with poorer behavioral records. The same general trend was observed for the NHSG and GED groups, although it was not as consistent across MLs.

Figure 6 shows that HSGs had fewer demotions compared to NHSGs and GEDs and that for HSGs, lower MLs were associated with slight increases in demotions. One exception was for the PIs, who had fewer demotions than all other MLs except ML-1s.

### **Advancement Examination Outcomes**

Figure 7 shows the percentage of individuals who passed the E-4 examination. Percentage passing decreased somewhat as ML decreased but the trend is erratic. Overall 98 to 99 percent of the examination takers (depending on the ED) passed the E-4 advancement examination.

Figure 8 shows the percentage of takers of the promotional examination who were advanced to E-4. Generally, decreases in ML were associated with decreases in percentage advancing to E-4. Overall, about 92 percent of the examination takers were promoted.

Figure 9 shows that the higher MLs received higher scores on the E-4 advancement examination.

### **Criterion Comparisons for Personnel in Entry-level Paygrades E-2 and E-3**

The criterion means for the personnel in entry paygrades E-2 and E-3, together with accompanying discussion, are shown in Appendix A. In summary, for E-2s and E-3s, the relationships of ED and ML to criterion performance were very similar to those found for E-1s. HSGs and higher MLs had better criterion performance than NHSGs, GEDs, and lower MLs.

### **Percentage Difference in the Criterion Distribution of PIs and the Lowest (Acceptable) MLs**

An estimate of the effects on criterion performance of the misnorming of ASVAB 5, 6, and 7 was made by calculating the differences in the levels of the distributions between PIs and the lowest acceptable ML (LAM) under the enlistment standards. These data, together with discussion and interpretation, are shown in Appendix B.

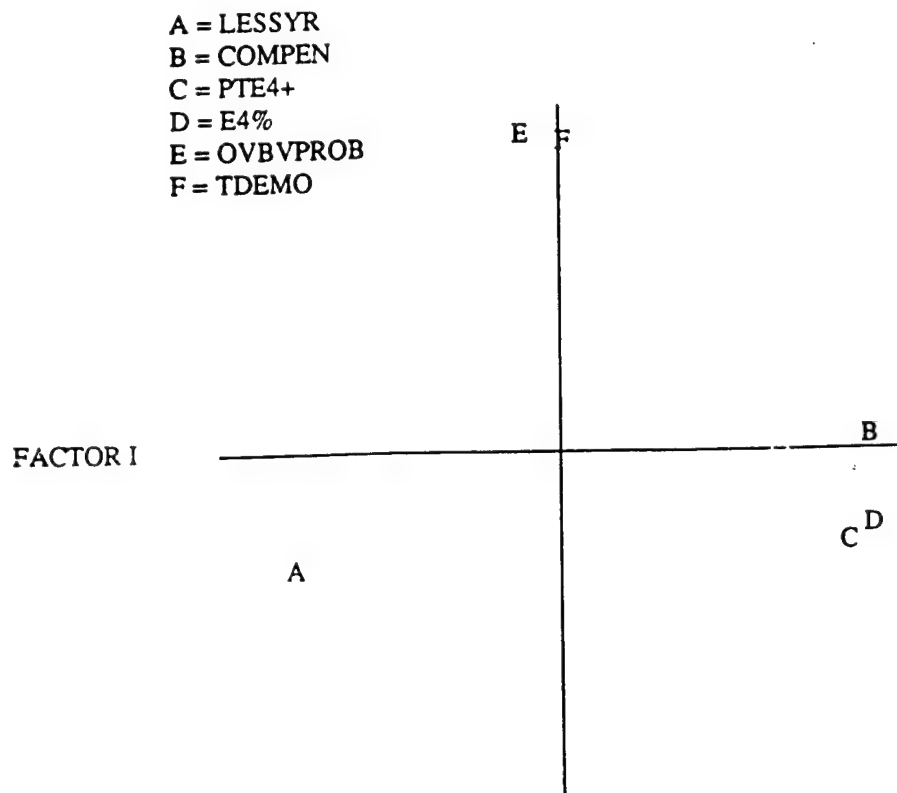
In summary, the major decreases in criterion performance of PIs in relation to LAMs occurred for advancement criteria, but PIs also were below LAMs in attrition/retention performance. The incidence of maladaptive behavior for PIs was about equal to that for LAMs.

**Table 8**  
**Rotated Principal Components for Six Job Outcome Measures (E-1s only)**

Variable	Performance	Behavior <sup>a</sup>	Communalities
LESSYR	-78	-35	73
COMPEN	90	03	80
PTE4+	84	-28	78
E4%	91	-23	89
OVBVPROB	-11	91	83
TDEMO	01	89	80
Eigenvalue	2.96	1.87	
Percentage of variance (Total percentage = 80.5)	49.36	31.18	

Note. Decimal points are omitted from the factor loadings and the communalities.

<sup>a</sup>Varimax rotation.



**Figure 10. Two dimensional representation of the factor loadings.**

## REFERENCES

- Boldt, R. F. (1980, August). *Scaling of the Armed Services Vocational Aptitude Battery Form 7 and the General Classification Test to the Armed Forces Qualification Test Scale* (Tech. Memo. 80-2). Washington, DC: Office of the Secretary of Defense, Directorate for Accession Policy.
- Cohen, J. (1969). *Statistical power analysis for the behavioral sciences*. New York: Academic Press.
- Greenberg, I. M. (1980, December). *Mental standards for enlistment performance of Army personnel related to AFQT/ASVAB scores*. Monterey, CA: McFann Gray and Associates.
- Hiatt, C. M., & Sims, W. H. (1980, November). *Armed Services Vocational Aptitude Battery (ASVAB) and job performance* (CNA 80-3121). Alexandria, VA: Center for Naval Analyses, Marine Corps Operations Analyses Group.
- Maier, M. H., & Grafton, F. C. (1980, August). *Renorming ASVAB 6 and 7 at Armed Forces examining and entrance stations* (Tech. Memo. 80-1). Washington, DC: Office of the Secretary of Defense, Directorate for Accession Policy.
- Maier, M. H., & Grafton, F. C. (1981, January). *Scaling Armed Services Vocational Aptitude Battery (ASVAB) or 8AX* (ARI Res. Rep. 1301). Alexandria, VA: Army Research Institute.
- Navy Personnel Research and Development Center. (1982, May). *Plan for validating enlistment standards against job performance* (unpublished manuscript). San Diego: Author.
- Reeg, F. J. (1981, June). *United States Navy enlistment qualification/quality* (unpublished manuscript). Washington, DC: U.S. Navy Recruiting Command.
- Sims, W. H., & Truss, A. (1980, May). *A reexamination of the normalization of the Armed Services Vocational Aptitude Battery (ASVAB) Forms 6, 7, 6E, and 7E* (CNS 1152), MCOAG Review Copy). Alexandria, VA: Center for Naval Analysis, Marine Corps Operations Analysis Group.
- Swanson, L. (1979). *Armed Services Vocational Aptitude Battery Forms 6 and 7: Validation against school performance in Navy enlisted schools, (July 1976-February 1978)* (NPRDC-TR-80-1). San Diego: Navy Personnel Research and Development Center.
- Thomas, E. D. (1969, February). *Navy recruit classification tests as predictors of performance in 87 class "A" enlisted schools (1964-1966)* (Spec. Rep. 69-14). San Diego: Naval Personnel Research Activity.
- Thomas, P. J. (1972a, January). *The relationship between Navy classification test scores and final school grade in 104 class "A" schools* (Spec. Res. Rep. 72-15). San Diego: Navy Personnel and Training Research Laboratory.
- Thomas, P. J. (1972b, April). *The relationship between Navy classification test scores and final school grade in 98 class "A" schools* (Spec. Res. Rep. 72-22). San Diego: Navy Personnel and Training Research Laboratory.

## **APPENDIX A**

### **RELATIONSHIP OF MENTAL LEVEL (ML) AND EDUCATION (ED) TO JOB OUTCOME VARIABLES FOR PERSONNEL ACCESSIONED AS E-2 OR E-3**

## RELATIONSHIP OF MENTAL LEVEL (ML) AND EDUCATION (ED) TO JOB OUTCOME VARIABLES FOR PERSONNEL ACCESSIONED AS E-2 OR E-3

E-2 and E-3 means for seven personnel-record-based criteria are given in Tables A-1 and A-2 and are shown in Figures A-1 through A-14. They cover the six performance criteria plus scores on the E-4 advancement examination. Data are not shown for the percentage passing and the percentage advancing to E-4 on the basis of the advancement examination because analysis of variance tests showed the means for E-2s and E-3s for these criteria were not significantly different from those for E-1s (previously reviewed). Tables A-1 and A-2 show the statistics, which are presented in graphic form in Figures A-1 through A-14.

Figures A-1 through A-14 contain the mean criterion scores for each of the MLs within each of the education categories. Overall means for the education categories are shown on the right-hand margins of the figures. The general educational development (GED) category is missing a value for ML 4, and the nonhigh school graduate (NHSG) category is missing values for MLs low 3 and 4. Individuals enlisted in these MLs were reclassified as potentially ineligible (PI) due to renorming of the Armed Forces Qualification Test or as usually ineligible.

Figures A-1 through A-4 show that the trends in the advancement criteria are very similar to those covered previously for E-1s. High school graduation and higher MLs were associated with larger percentages achieving E-4 and larger percentages of time spent at E-4+ than for NHSGs, GEDs, and lower MLs. The trend of ML means was quite regular for high school graduates (HSGs), but erratic for NHSGs and GEDs. The improvement in criterion performance based on ML was sharper for E-3s (Figures A-2 and A-4) than for E-2s (Figures A-1 and A-3). For instance, for E-3s, the differences between the means for HSGs for ML 1s and PIs were about 30 percentage points compared with differences for E-2s of about 15 percentage points.

Figures A-5 through A-9 show the superiority of HSGs and higher MLs over NHSGs, GEDs, and lower MLs in enlistment completion and first-year attrition. For both E-2s and E-3s, HSGs had considerably higher percentages of enlistment completions than NHSGs and GEDs (Figures A-5 and A-6). The relationship of ML to enlistment completion was much weaker.

ML and ED were about equally related to first-year attrition (Figures A-7 and A-8). For HSGs, the subgroup for which the trends were most regular, the attrition rate of PIs was roughly double that of ML 1s. Similarly, attrition rates for GEDs and NHSGs were from 70 percent to 100 percent higher than those for HSGs.

Figures A-9 through A-12 show that HSGs had much less maladaptive behavior than NHSGs and GEDs. Demotions and other maladaptive behavior for NHSGs and GEDs ranged from 25 percent to 300 percent greater than those HSGs. There was no consistent overall trend in the relationship of ML to maladaptive behavior.

Figures A-13 and A-14 show that higher ML personnel had substantially higher scores on the E-4 advancement examination than lower ML personnel. In contrast, level of education had very little effect: The mean scores of HSGs, GEDs, and NHSGs were about the same.

Table A-2  
Job Outcome Criterion Means for ED and ML Subgroups of the E-3 Group

Criterion	ED			ML												UI		
				1			2			H3			L3			4		
	M	N		M	N		M	N		M	N		M	N		M	N	
<u>Advancement</u>																		
PTE4+	HSG 57	13,264	67	3,386	58	7,878	44	911	36	487	32	372	25	227	81	3		
	GED 40	667	53	111	44	384	21	58	20	48	--	--	26	58	16	8		
	NHSG 32	465	61	26	41	175	32	67	--	--	--	--	27	49	17	148		
E4%	HSG 80	13,264	88	3,386	81	7,878	71	911	65	487	59	372	51	227	100	3		
	GED 58	667	70	111	64	384	36	58	33	48	--	--	45	58	38	8		
	NHSG 50	465	77	26	59	175	54	67	--	--	--	--	45	49	34	148		
<u>Attrition/Retention</u>																		
COMPEN	HSG 75	13,264	77	3,386	75	7,878	74	911	71	487	74	372	70	227	100	3		
	GED 62	667	64	111	61	384	64	58	54	48	--	--	69	58	75	8		
	NHSG 63	465	69	26	64	175	61	67	--	--	--	--	63	49	63	148		
LESSYR	HSG 12	13,264	9	3,386	12	7,878	13	911	16	487	17	372	20	227	0	3		
	GED 19	667	16	111	18	384	24	58	25	48	--	--	26	58	12	8		
	NHSG 25	465	19	26	26	175	27	67	--	--	--	--	27	49	24	148		
<u>Maladaptive Behavior</u>																		
OVBVPROB	HSG .42	13,264	.34	3,386	.43	7,878	.58	911	.52	487	.45	372	.70	227	.42	3		
	GED 1.86	667	1.83	111	1.97	384	1.73	58	1.25	48	--	--	1.77	58	2.12	8		
	NHSG 1.57	465	.25	26	.74	175	2.62	67	--	--	--	--	2.17	49	2.09	148		
TDEMO	HSG .20	13,264	.20	3,386	.20	7,878	.20	911	.17	487	.16	372	.22	227	.33	3		
	GED .31	667	.32	111	.33	384	.36	58	.19	48	--	--	.24	58	.12	8		
	NHSG .25	465	.12	26	.17	175	.36	67	--	--	--	--	.33	49	.28	148		
<u>Advancement Examination</u>																		
SCOR4	HSG 51.2	251	58.3	42	51.9	157	46.8	20	42.2	14	40.9	11	39.0	7	--	--		
	GED 56.6	8	65.5	2	53.7	6	--	--	--	--	--	--	--	--	--	--		
	NHSG 54.0	4	--	--	67.0	1	61	1	--	--	--	--	45.0	1	43.0	1		

Note. For subgroups with N < 5 the criterion means were not plotted in Figures A-1 through A-14.

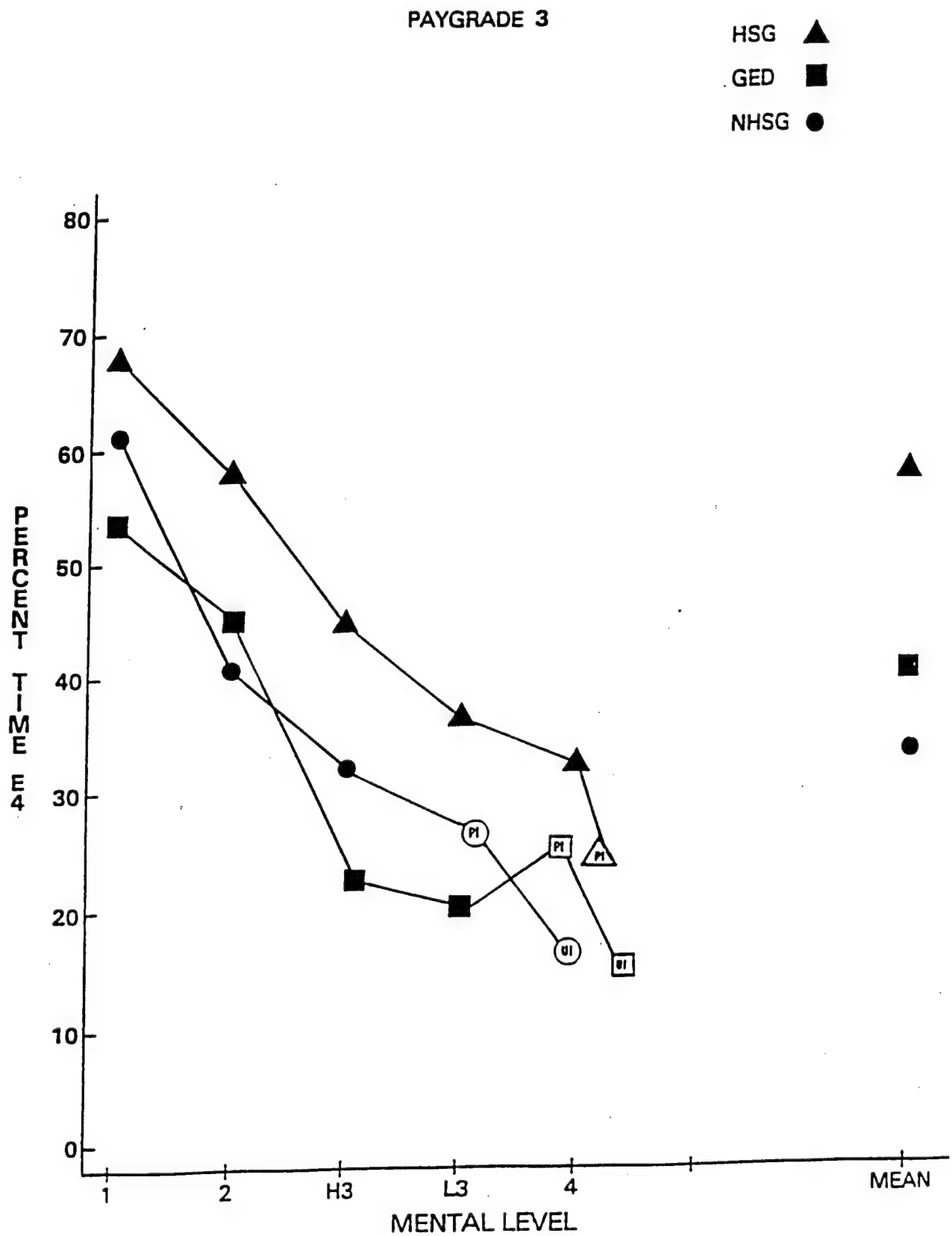


Figure A-2. Paygrade 3: Percent of 4-year enlistment period spent as an E-4 or higher.



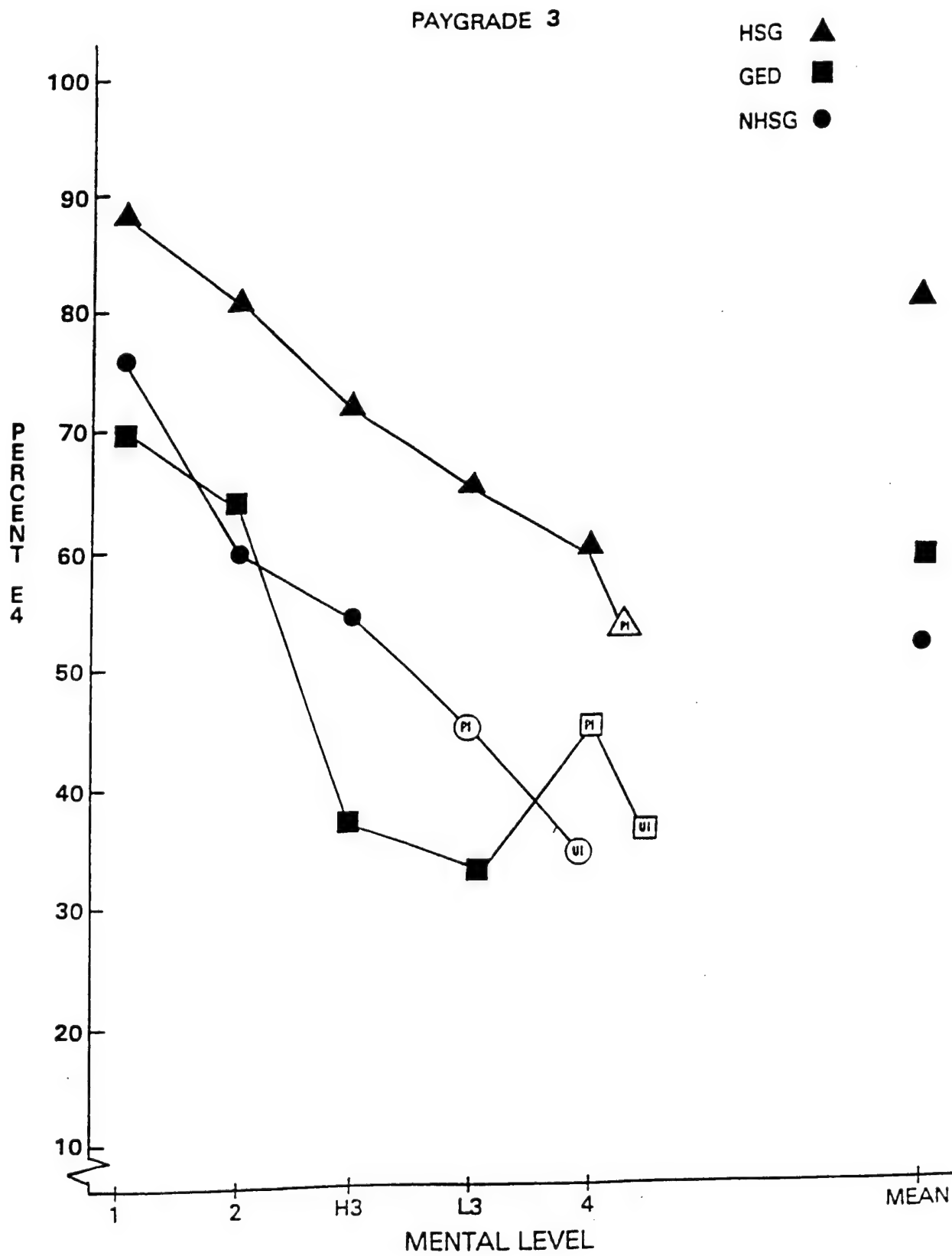
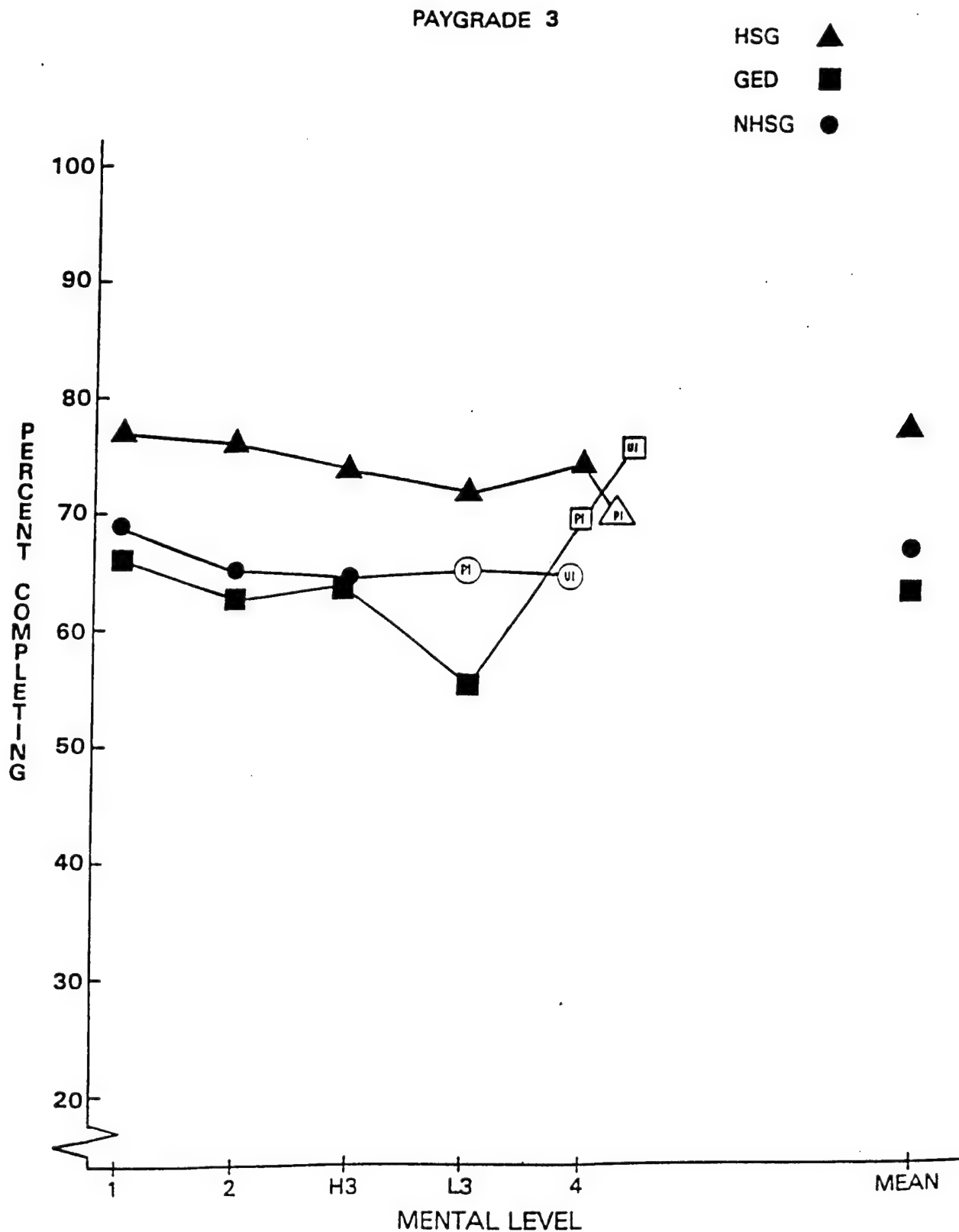
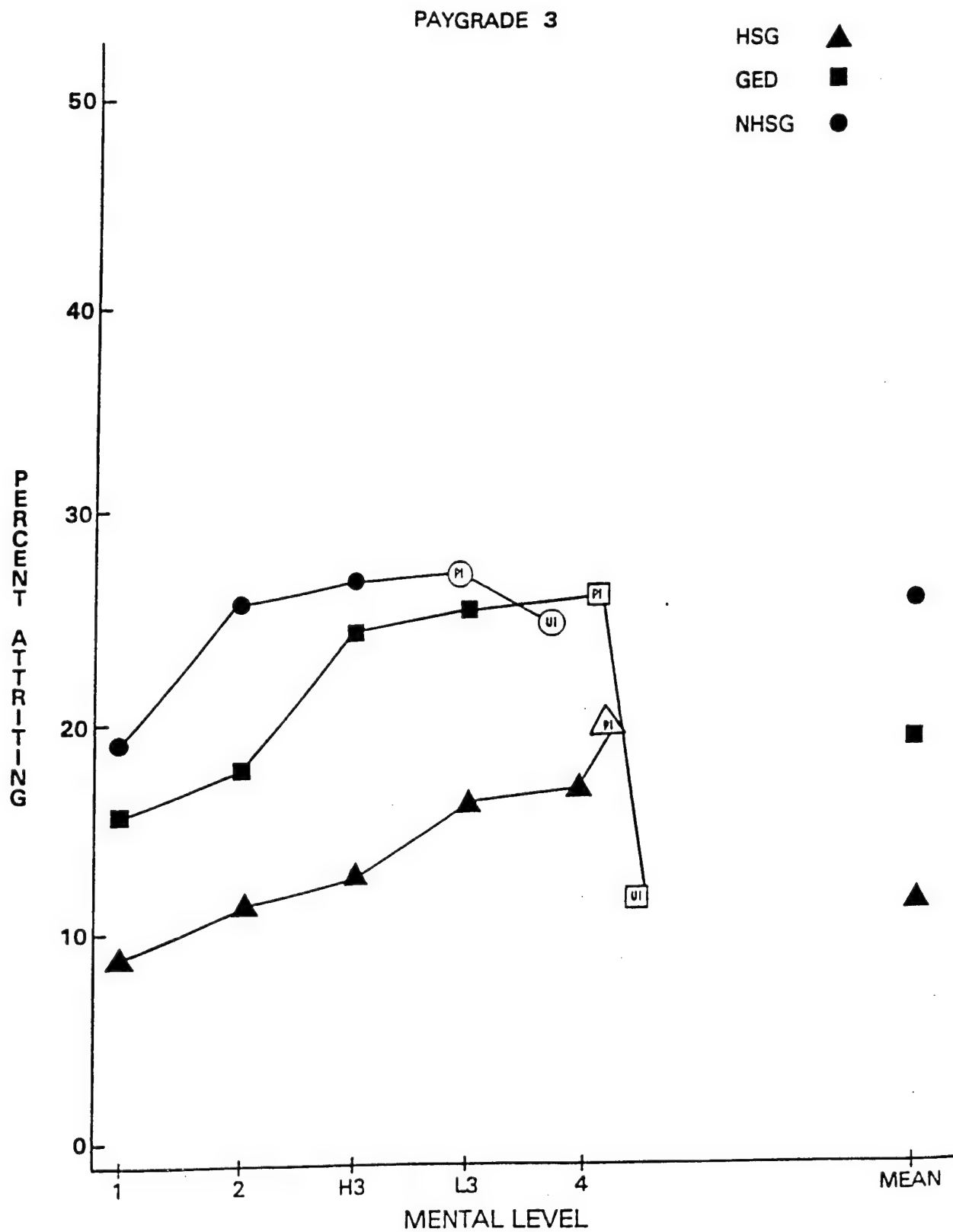


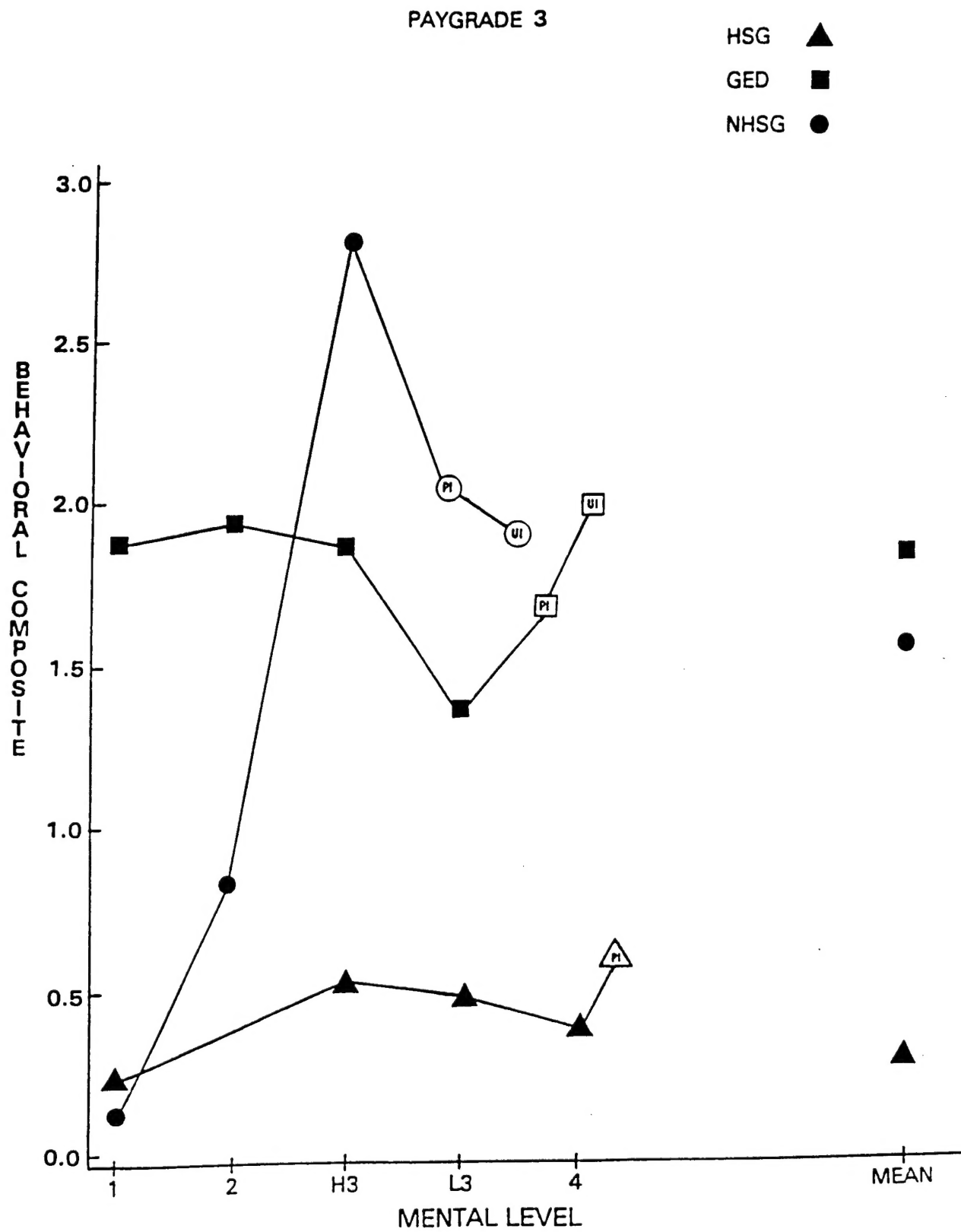
Figure A-4. Paygrade 3. Percent achieving E-4.



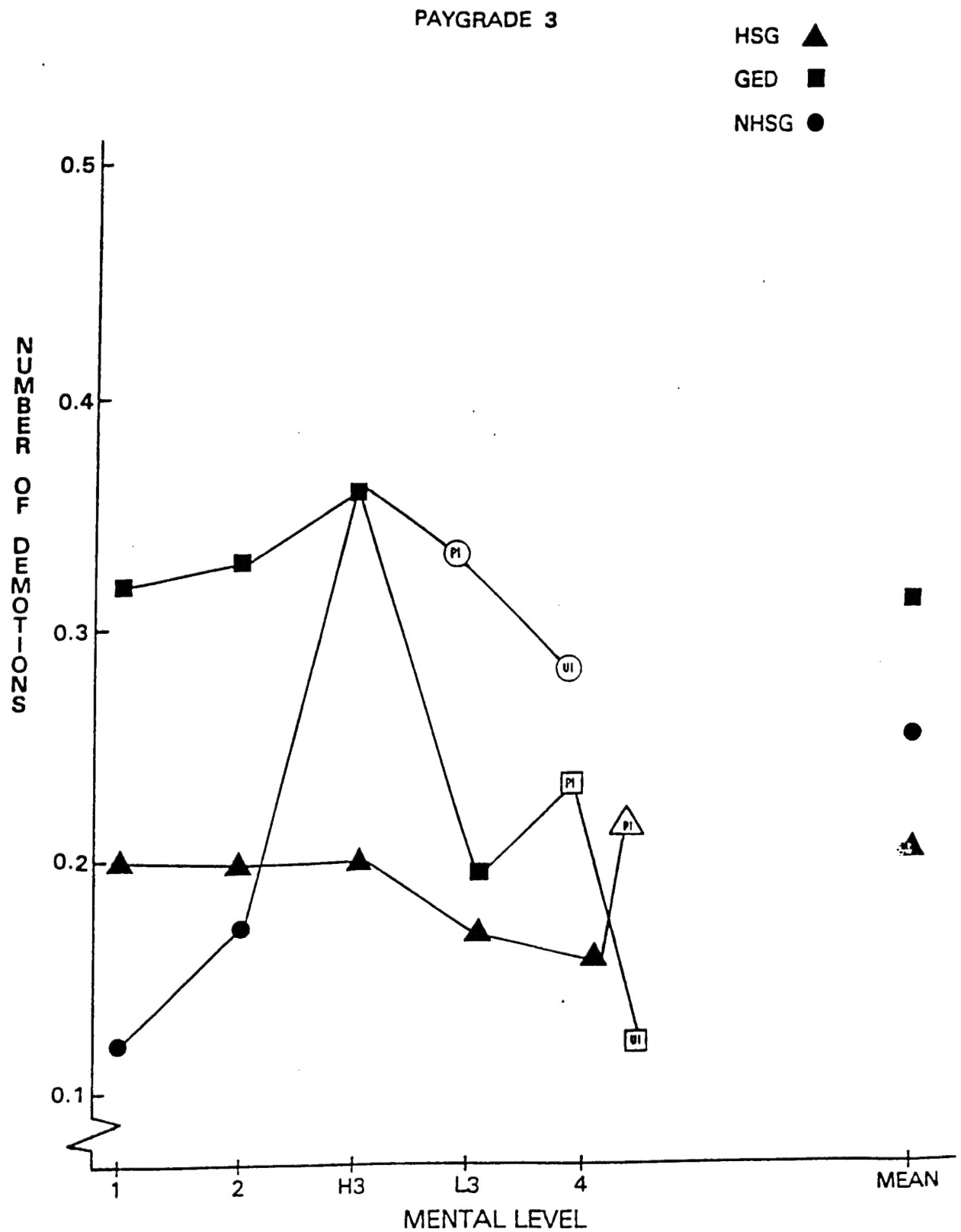
**Figure A-6. Paygrade 3: Percentage completing 4-year enlistment.**



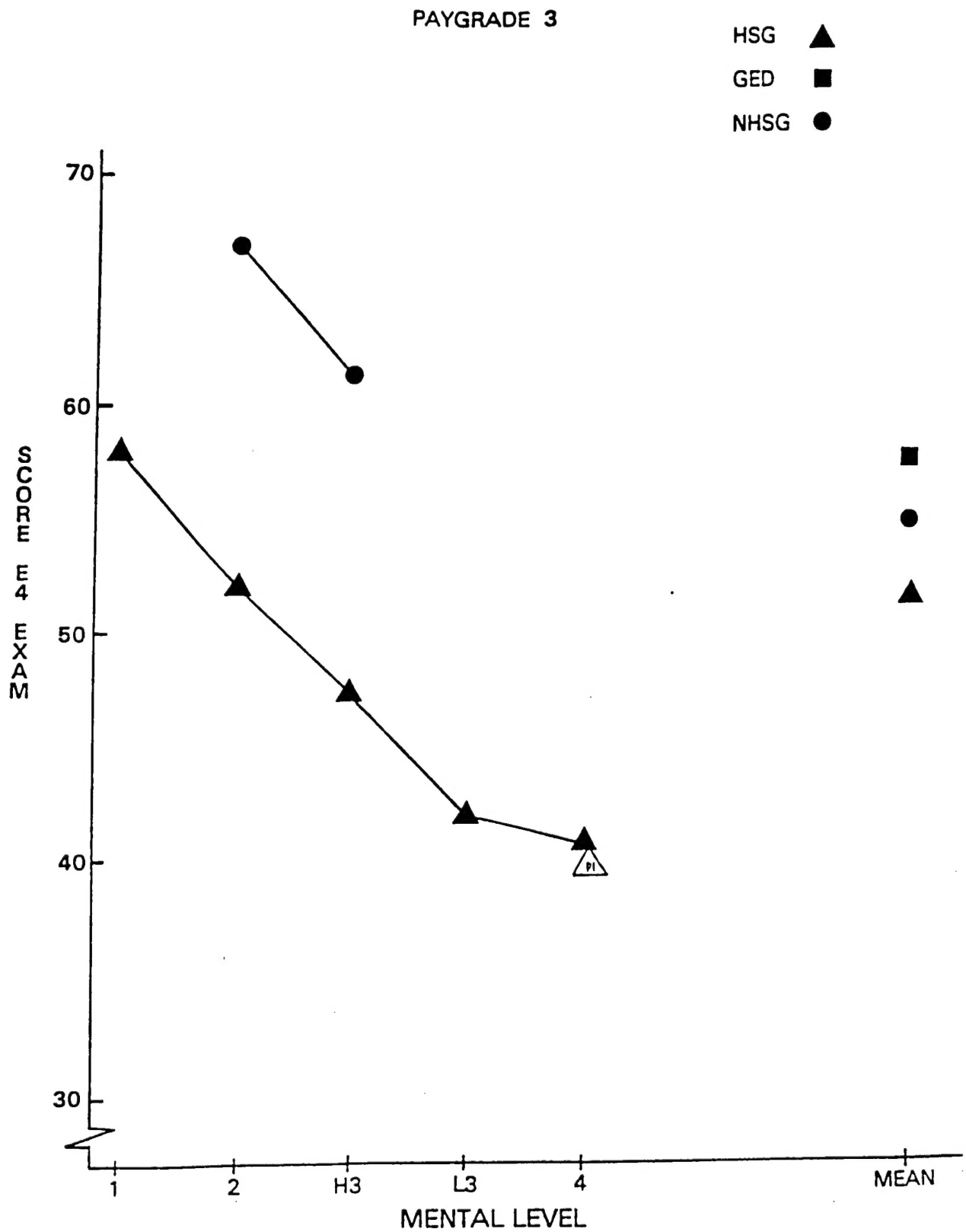
**Figure A-8. Paygrade 3: Percentage attriting in less than 1 year.**



**Figure A-10. Paygrade 3: Overall behavioral problems.**



**Figure A-12. Paygrade 3: Total number of demotions.**



**Figure A-14. Paygrade 3: Navy standard scores for E-4 exam.**

## **DISTRIBUTION LIST**

Chief of Naval Operations (OP-13)

Bureau of Naval Personnel (PERS-234)

Defense Technical Information Center (DTIC) (2)